D R A F T

22 June 1966

TEST ~~SPECIF~~ PARAMETERS ICATIONS - 4" x 5" CHIP PROCESSOR

1. Scope.

This ~~test specification~~ document is to describe all the parameters to be evaluated and tests to be performed in the test and evaluation of a processor which will automatically process 4" x 5" cut film (chips) at a rate of up to 10 chips per minute.

Every operational test possible shall be accomplished as well as determination of the photographic capabilities of the item of equipment.

2. Responsibility.

It will be the responsibility of the Procuring Agency monitor to supervise all phases of the tests performed and the evaluations resulting therefrom.

3. Operational Tests.

3.1. The criteria set forth in this ~~specification~~ document ~~is~~ are intended to serve as the minimum acceptable standard.

3.2. Documentation.

3.2.1. A complete, written, detailed history will be maintained on all tests performed and results obtained. All entries will be made chronologically in a permanently bound ledger book using either black ink or ball point pen. The Inspector Check List (Appendix I) will be used while performing all phases of testing. The ledger and check list will be forwarded with the completed test report to the procuring agency. (See paragraph ~~4~~ 7 for test report requirements.)

3.3. Quality Control.

3.3.1. Rigid quality control will be exercised in all phases of this test to preclude introduction of outside contamination which

could degrade test results.

3.4. Processor Unit.

3.4.1. Visual Inspection.

3.4.1.1. Inspect exterior and interior for quality of workmanship, i.e., sharp edges, freedom from burrs, loose and missing screws, proper fitting and closing of access doors, panels, hardware, etc.

3.4.2. Tank Filling Provisions.

3.4.2.1. Fill solution tanks and wash tank with water and evaluate adequacy of filling provisions. Accurately measure and record volume and time required to fill each tank.

3.4.3. Control Panel.

3.4.3.1. Check the following controls for proper operation.

a. Film transport drive switch

b. Film transport speed control

c. Pump switch

d. Elevator overide up & down switches

e. Temperature control pot

f. Dryer switch and control pot

g. All indicator lights

3.4.3.2. Check the Film Transport Speed Indicator for accuracy. Measure the system speed from 1 through 10 chips per minute. Selected speed error should not exceed plus or minus five per cent.

3.4.3.3. Check the solution temperature indicator for accuracy using a Bureau of Standards thermometer calibrated to 0.1°F. This should be done for all positions of the temperature control range.

3.4.4. Solution Temperature Equalization Time - Energize the chemical solution heating system. Using a thermometer calibrated to 0.10°F, record the capability of maintaining fixed temperatures to ±0.25°F through the range of 65°F to 85°F in 5°F increments during a series of four hour periods for each 5° increment. Prepare in graph form, results of these ranges versus processing temperature equalization time.

NOTE: The wash water should be at least 5°F below the chosen processing temperature. In those cases where local tap water is not cool enough, an external water chiller will be required.

3.4.5. Film Drying.

3.4.5.1. Drier Temperatures. Considering an ambient temperature of 70°F, ±5°F, and a relative humidity of 45%, determine the maximum drying temperature attainable and the time required to reach that temperature. Check and record, through a series of four hour periods, the capability of the drier to maintain fixed temperatures of 120°F, 130°F, and 140°F within ±2°F.

3.4.5.2. Check and record the drying capability at the operational speed of 10 chips/minute.

3.4.5.3. Check the operation of the output magazine and elevator.

3.4.6. Drain System Adequacy.

3.4.6.1. Determine the ability of the drainage system to carry off overflow of wash water and ~~overflow of~~ chemicals. ~~and to drain tanks at an adequate rate.~~ Check & record the time required for complete drainage of the system.

3.4.7. Agitation. Determine the uniformity of agitation throughout the entire processing system by microscopic examination of a random sampling of processed chips for sediment content. If unsatisfactory agitation is evident, recommendations for improvement should be recorded.

3.4.8. Filtration Systems.

3.4.8.1. Chemical and Water Filtration. Determine, by using a ~~particular~~ particle counter, located downstream from the filter, the actual filtration capability of each filter system (developer, stop-bath, fixer, and hypo-eliminator).

NOTE: Both the chemical and water filtration units are to filter and maintain the solutions to below the 10-micron level.

3.4.8.2. Air Filtration. Determine, by a similar method to the above, the actual filtration capability of the drier chamber. Further, investigate for occurance of any film flutter created by the high air velocities in the drier.

3.4.9. Wash Water.

3.4.9.1. Measure and record water consumption in gallons/minute.

3.4.9.2. Check ability of water mixing value to maintain pre-set temperatures of the wash water to $\pm 2^{\circ}F$.

3.5. Loading and Chip Feed.

3.5.1. Evaluate the loading station for light-tightness and provisions for convenience and reliability.

3.5.2. Determine ~~if~~ that the magazine can only be loaded in the proper feed position.

3.5.3. Check the operation of the signal device ~~provided for~~ indicating an empty magazine.

3.5.4. Check the hydraulic slide or chip injector for proper operation.

3.5.5. Check the time delay relay associated with the magazine locking switch for accuracy of the required 3 minute interval prior to slide injection. ~~s between magazines~~.

3.6. Chemical preparation ~~for processor~~.

3.6.1. Processing Solutions. Considering the operating speed of ten chips per minute, and the operating temperature range, determine the best chemistry or chemistries, to be used to process 8430 and 5427 type films to attain or surpass the film manufacturer's specifications.

3.6.2. Fill processor solution tanks with chemicals.

3.6.3. Replenishment System Tests. Measure and record replenishment rates for developer, short stop, fixer and hypo eliminator, in cubic centimeters per minute. Compare with required rates. Required rates can be determined from film-processing combination specifications by manufacturer of film and/or chemicals. Evaluate provisions for adjusting replenishment rates to desired rates. Evaluate stability of replenishment rates.

3.6.4. Leakage. Inspect for evidence of leakage or spillage ~~and~~ that might degrade processor operation. Inspect all valves, pumps, ~~and all~~ gaskets and seals. Inspect for corrosion effects of chemicals in all parts including pump motor housings.

4. Photographic Tests.

4.1. Preparation of Test Materials.

4.1.1. Film Chips Typical Images. Prepare film chips (containing high resolution (>100 l/mm) reconnaissance imagery) on 8430 and 5427 type aerial duplicating films, ~~of image characteristics that the processor is designed to handle~~. Prepare a sufficient number for an adequate test run - minimum of 50 chips of each film type.

4.1.2. Film Chips, Sensitometric Exposures. Prepare films chips containing a gray scale, printed by an accurate sensitometer,

~~from~~ of a ~~xxix~~ calibrated ~~[illegible]~~ (>14 steps) step wedge. Minimum of 300 of each film type will be required. These strips ~~will~~ are to be used for determination of gamma and to statistically set up quality control standards. A large number of sampling is advised to establish data for Q.C. Standards. (Refer to 4.3.6.1 and 5.2)

4.1.3. Film Chips ~~Mxfix~~ Uniform Exposure. Prepare film chips with uniform overall exposures to density values of .30 and 1.0 for determining uniformity of processing. Minimum of 10 chips of each exposure level will be required. (Refer to 4.3.2)

4.1.4. Resolution. Prepare chips with resolution targets for comparison to a known printer-processor film combination that yields extremely high quality. Example: A high contrast 800L/MM resolution target, printed 25X1A
25X1A on the [redacted] Printer, on 8430 type film, and processed in a [redacted]
25X1A processor, utilizing [redacted] type A chemistry, will consistantly yield a reproduction resolution of about 400 Lines/MM. Utilizing the same resolution targets, the same printer and the same emulsion, a resolution comparison test can be performed between the chip 25X1A
25X1A processor and a [redacted] processor. The quality of the [redacted] processor is considered very acceptable and therefore ~~could~~ can be a useful comparison device in a processing resolution test. A minimum of 25 chips prepared with resolution targets will be required.

~~4.2. Processing of Exposed Test Chips Operate processor in~~

4.2. Processing of Exposed Test Chips. Operate the processor in accordance with ~~standard practice~~ recommended procedures and process exposed test film chips. (Refer to 4.1.1) Change solutions if necessary to meet requirements of different emulsions.

4.3. Evaluation of Processed Material. ~~Evaluate the processed film for photographic~~ quality by critically examining ~~the processed film~~ using microscopes, magnifiers, a densitometer, and ~~all~~ that laboratory equipment ~~as~~ required to determine the performance quality of the processor.

4.3.1. Light Tightness. Examine film that has been processed with the processor in normal room light for any evidence of light leakage in the processor.

4.3.2. Uniformity of Development. Select 10 random processed film chips that have received uniform sensitometric exposure over the ~~picture~~ image area, 5 of each exposure level. Measure the developed density, with a densitometer, for evidence of uneven development from frame to frame, and edge to edge, and for streaks and mottling. Pick 10 random areas on each chip for these measurements. Record the maximum and minimum densities found in areas of uniform exposures. Compare with accepted standards for uniformity of development.

4.3.3. Freedom from Physical Damage. Use a microscope to examine random processed chips for evidence of physical damage. Check for abrasions, scratches, image distortion, pressure marks, emulsion frilling, mottling, creases, water marks, drying marks, and foreign matter in the emulsion.

4.3.4. Dimensional Stability. Determine if any significant amount of stretch or shrinkage of the emulsion occurs during processing. The dimensional stability test shall be performed in accordance with ASA test procedure paragraph 1.32-1959. At least 25 chips from random processes should be evaluated for stretch or shrinkage.

4.3.5. Resolution Values. Compare resolution values, with a high power microscope, of processed chips against a known processor as above. Do not rely on the film manufacturer's resolution ~~specs,~~ specifications as these specifications, regarding resolution, tend to be conservative with respect to our interests in the limits of the resolution possible and not the average.

4.3.6 Granularity. Using the processed, uniformly exposed chips with the density of 1.0 (refer to 4.3.2) determine the root mean square (RMS) granularity for both 5427 and 8430 type films. Compare and record the values obtained against the film manufacturers specifications. Record also the processing chemistry used as well as speed and temperature.

4.3.7. Gamma

4.3.7.1. Step Wedges -- Process several of the gray scale step wedges. Evaluate them by reading on a densitometer and plotting their corresponding characteristic H&D curves. Adjust the developer concentration to produce an approximation of a controlled process that will yield an ideal density and gamma for the film and chemical combination used, according to manufacturers specifications. As the control of gamma is a function of development, gamma can be altered by changing processing time, temperature or concentration. Assuming that an ideal concentration has already been established and will be maintained by proper replenishment, gamma can be controlled by temperature and speed. Prepare a family of characteristic curves (through the use of control strips) of speed and temperature relationships. These curves will become part of the processing specs for this processor.

4.3.7.2. Power Changes -- Determine effects on the time gamma curves of the processed film due to a change 0 $\pm$ 20 volts from the required 220 volt machine input.

4.3.8. Archival Quality -- Perform the Crabtree-Ross turbulation test to determine the thiosulfate content of washed film. The test should be conducted as outlined in American Standards Association publication number PH4. 8-1958. This should be performed on film which has been processed at the maximum processing speed obtainable on the machine (10 chips per minute). If the thiosulfate content is in excess of 0.005 (plus or minus 0.001) milligrams per square inch, then the test should be repeated at slower speeds until this value is obtained. Archival quality is desirable at maximum processing speeds. Note the speed at which archival quality was achieved.

5. Quality Control.

5.1. Chemical Analysis -- Chemical analysis shall be performed daily during the test program. The developer ~~should~~ shall be analyzed for PH, hydroquinone, elon, and sulfite content. The fixer ~~should~~ shall be analyzed for PH, acid index, thiosulfate, and silver content. All data acquired from the analysis shall be properly documented. This analysis will yeild useful information in regard to the accuracy of replenishment rates, general chemical oxidation rates and how individual film types affect chemical deterioration rates. The analysis will also provide useful information in determining the chemical life, with proper replenishment, before discarding.

5.2. Sensitometric Standards.-

5.2.1. The processing solutions should first be brought to a state of equilibrium by processing 50 light fogged, film chips.

5.2.2. Preliminary Processing Standard. Process 10 sensitometric control strips at one time. Read on a densitometer the 9th, 11th, and 15th step of all the ten strips. Average the ten 9th, 11th, and 15th steps respectively. The three resulting average densities become the preliminary control standard check points. The use of three check points is necessary for determining accurate control of the process. As a preliminary standard, a ~~mix~~ maximum deviation density difference from these check points must be assigned to set the preliminary acceptable tolerances of the processor. A value of ± .10 to .15 density difference can be used from the average, of each of the three preliminary check points as acceptable tolerances.

5.2.3. Accurate Standards Density -- More accurate values of the 9th, 11th, and 15th steps and the exact maximum tolerance deviation from these respective steps, can only be established after data has been collected from 100-150 control strips, processed at set

intervals (example 4 strips/per day). Then, by the following statistical formula, an accurate sensitometric control for this chip processor can be established.

$$\sigma = \sqrt{\frac{\sum x_i^2}{n} - \bar{x}^2}$$

σ = STANDARD DEVIATION

x_i = EACH VALUE TAKEN IN TURN

$\bar{x}$ = THE AVERAGE VALUE

n = NUMBER OF SAMPLES

MAXIMUM DEVIATION OR ~~MAXIMUM~~ TOLERANCE LIMITS

CAN BE EXPRESSED AS

$$L = \pm 3\sigma$$

6. Maintenance -- Evaluate maintenance procedures as outlined in operational and maintenance manual supplied by the ~~processor~~ manufacturer ~~manual~~. Determine by testing where procedures are inadequate or adequate as described. Determine if gasket or seal materials will withstand the corrosion action of photographic chemicals with particular attention to the stop and/or fixing baths. During the test program continually inspect all parts of the processor ~~machine~~ for evidence of corrosion due to chemicals.

7. Test Report.

7.1. Examine the records of the completed tests and evaluate the performance of the processor for ~~in~~ each item tested as compared to existing standards of performance for similar tests ~~work~~. Evaluate the overall performance of the processor taking into account the type of work to be performed, the expected operational environment, the qualifications of the operating personnel, the service and maintenance required, and the overall operating reliability.

7.2. The following format will be used for this Test Report:

a. Abstract

b. Purpose

c. Test Procedures

d. Test results

e. Conclusions

f. Recommendations

g. Appendixes (This should include all graphs, charts photographs, etc., required to support conclusions. Representative H&D curves should be included for each emulsion tested.)

CONFIDENTIAL

INSPECTOR CHECK LIST

4" X 5" Chip Processor

PARAGRAPH	TITLE	DATE	ACCEPTABLE	UNACCEPTABLE
3.4.1.1	Visual Inspection			
3.4.2.1	Adequacy of Filling Provisions			
3.4.3.1	Controls			
3.4.3.2	Film Transport Speed Indicator			
3.4.3.3	Solution Temperature Indicator			
3.4.4	Solution Temperature Equalization Time			
3.4.5.1	Drier Temperature			
3.4.5.2	Drying Stability At 10 Chips/Min			
3.4.5.3	Output Magazine and Elevator			
3.4.6.1	Drain System			
3.4.7	Agitation			
3.4.8.1	Chemical Filtration			
3.4.8.1	Water Filtration			
3.4.8.2	Air Filtration			
3.4.9.1	Wash Water Consumption			
3.4.9.2	Water Mixing Valve			

Inspector's Remarks (continue on back of sheet if necessary)

INSPECTOR CHECK LIST
(Continued)

4" X 5" Chip Processor

PARAGRAPH	TITLE	DATE	ACCEPTABLE	UNACCEPTABLE
3.5.1	Loading Station			
3.5.2	Magazine Feed			
3.5.3	Magzine Signal Device			
3.5.4	Chip Injector Operation			
3.5.5	Time Delay Relay			
3.6.3(a)	Replenishment - Developer			
3.6.3(b)	Replenishment - Short Stop			
3.6.3(c)	Replenishment - Hypo			
3.6.3(d)	Replenishment - Hypo Eliminator			
3.6.4(a)	Leaks - Values			
3.6.4(b)	Leaks - Seals & Gaskets			
3.6.4(c)	Leaks - Pumps, Motors			
4.3.1	Light Tightness			
4.3.2	Uniformity of Development			
4.3.3	Freedom From Physical Damage			
4.3.4	Dimensional Stability			
4.3.5	Resolution Values			
4.3.6	Granularity			
4.3.7.1	Gamma			
4.3.7.2	Time Gamma Curve			
4.3.8	Archival Quality			
5.1	Chemical Analysis			
6.0	Maintenance Schedule			

Inspector's Remarks (continue on back of sheet if necessary)

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4 X 5 CHIP PROCESSOR

OBJECTIVE

The objective of the following program is to evaluate the photographic and functional performance of the 4-by 5-inch film chip processor.

A. Inspect and check out mechanical, electrical, and plumbing components and systems for workmanship and proper operation as follows:

(1) Visual Inspection -- Inspect exterior and interior for quality of workmanship including necessary sturdiness, freedom from burrs, scratches, and other visible imperfections. Inspect controls and indicators for accessibility and ease of operation. Consider maintenance servicing requirements and determine adequacy of provisions as related to frequency of requirements and type of personnel to perform maintenance. Examine provisions for installation and for plumbing and electrical connections.

(2) Tank Filling Provisions -- Fill solution and wash tanks with water and evaluate adequacy of filling provisions. ACCURATELY MEASURE AND RECORD VOLUME OF SOLUTION IN EACH TANK. NOTE TIME REQUIRED TO FILL TANKS

(3) Processing Solutions -- For the operating speed allowable, considering the rate of ten chips per minute, and considering the operating temperature range, determine the best chemistry or chemistries, to be used in the chip processor, to process 8430 and 5427 films to the film manufacturer's specifications.

(4) Solution Temperature Equalization Time - Energize heating system and collect data in regard to the processing temperature equalization time for a range of temperatures from 65^{o}-75^{o}F. Prepare a graph showing range of operating temperatures (in increments of 5^{o}) vs processing temperature equalization time, (with separate curves for room temperatures of 65^{o}, 70^{o}, and 75^{o}F).

(5) Solution Temperature Accuracy - Use calibrated therometer ACCURATE TO .1 °F, to determine accuracy of solution temperature. Accuracy should be maintained between the 65^{o}-85^{o}F range to a maximum tolerance of $\pm\frac{1}{4}^{o}$F in the developer tank and $\pm 2^{o}$F in stopbath, fixer, hypo eliminator and wash tanks.

(6) Temperature Indicator - Through the entire processing range of 65^{o}-85^{o}, check ready-light indicator for accuracy and determine if tolerance of light, on-off position, corresponds to tolerance of processing solution (emphasis on the developer solution).

(7) Drier Temperatures -- Determine maximum drying temperature and time to reach different temperatures throughout the entire drying temperature range, considering an ambient temperature of 70°F $\pm 5^{o}$F and a relative humidity of about 45%. Prepare graph showing dryer temperature in ^{o}F vs time in minutes to reach any given temperature. Check drying thermostat to maintain temperature accuracy to $\pm 2^{o}$F.

(8) Drain System Adequacy -- Determine ability of drain system to carry off wash water and overflow of chemicals and to drain tanks at an adequate rate.

(9) Agitation -- Determine if uniformity of agitation exists throughout an entire chemical tank. Also determine if agitation is sufficient to prevent sediment forming on film chips. If agitation conditions are not satisfactory, make recommendations necessary to improve the agitation system.

FILTRATION SYSTEMS
(10) a. Chemical & Water Filtration -- Determine the partixle size the filtration system will filter out of the solutions. If the particle size is greater than 10 microns determine and recommend a more efficient filter cartridge. Use parallel laboratory tests, utilizing chemical filter papers, calibrated in microns, to determine particle filtration capability of the filter system in the chip processor.

b. Air Filtration -- The drier chamber is operated with filtered air specified at below 1 micron particle size. With the use of an air sampling - particle counter device determine if this specification is in order. Also determine if the high air velocity causes any film flutter. The design is supposed to allow for the high velocity without film flutter.

(11) Measure and record water consumption, during operation, in gallons per minute. Determine accuracy of water tempering valve and through what range of temperatures for both hot and cold water will the mixing value function.

(12) Power Changes -- Determine effects on the time gamma curves of the processed film due to a change of ±20 volts from the required 220 volt machine input.

B. Preparation of Test Materials

(1) Film Chips, Typical Images -- Prepare film chips, on 8430 and 5427 type aerial duplicating films, of image characteristics that the processor is designed to handle. Prepare a sufficient number for an adequate test run - minimum 50 chips of each film type.

(2) Film Chips, Sensitometric Exposures -- Prepare films chips containing a gray scale, printed by an accurate sensitometer, from a calibrated step wedge. Minimum of 300 of each film type will be required. These strips will be used for determination of gamma and to ~~xxxxx~~ statistically set up quality control standards. A large number of sampling is advised to establish data for Q.C. Standards.

(3) Film Chips Uniform Exposure -- Prepare film chips with uniform overall exposures to density values of .30 and 1.0 for determining uniformity of processing. Minimum of 10 chips of each exposure level will be required.

(4) Prepare chips with resolution targets for comparison to a known printer-processor film combination that yields extremely high quality. Example: A high contrast 800L/MM resolution target, printed on the Niagara Printer, on 8430 type film, and processed in a Versamat processor, utilizing Versamat type A chemistry, will consistantly yield a reproduction resolution of about 400 Lines/MM. Utilizing the same resolution targets, the same printer and the same emulsion, a resolution comparison test can be performed between the chip processor and a Versamat processor. The quality of the Versamat

processor is considered very acdeptable and therefore could be a useful comparison device in a processing resolution test. A minimum of 25 chips prepared with resolution targets will be required.

(5) Processor Preparation -- Fill processor solution tanks with chemicals and bring processor to operating temperatures.

C. Operational Performance.

Operate processor in accordance with standard practice and process exposed test film chips. Change solutions if necessary to meet requirements of different emulsions.

(1) Loading and Chip Feed -- Evaluate loading and chip feed provisions for convenience and reliability. Determine if the magazine can only be loaded in the proper position. A signal device is provided to show an empty magazine. Test this signal device to determine if it works consistantly during the entire test program.

(2) Film Transport Speed Tests -- Measure chip feed system speed from 1-10 chips/minute, as related to immersion times. Repeat measurement several times during test to check for variations. Record all measurements for evaluation of processing accuracy and repeatability.

(3) Replenishment System Tests -- Measure and record replenishment rates for developer, short stop, fixer and hypo eliminator, and fixer in cubic centimeters per minute. Compare with required rates. Required rates can be determined from film-processing combination specifications by manufacturer of film and/or chemicals. Evaluate provisions for adjusting replenishment rates to desired rates. Evaluate stability of replenishment rates.

(4) Leakage -- Inspect for evidence of leakage or spillage that might degrade processor operation. Inspect all valves, pumps, and all gaskets and seals. Inspect for corrosion effects in all parts including pump motor housings.

D. Evaluation of Processed Material.

To evaluate the processed film for photographic quality, critically examine the processed film using microscopes, magnifiers, a densitometer, and all laboratory equipment as required to determine the performance quality of the processor.

(1) Light Tightness -- Examine film that has been processed with the processor in normal room light for any evidence of light leakage in the processor.

(2) Uniformity of Development -- Selecting 10 rnadom processed film chips that have received uniform sensitometric exposures over the picutre area, 5 of each exposure level, measure developed density, with a densitometer, for evidence of uneven development from frame to frame, and edge to edge, and for streaks and mottling. Pick 10 random areas on each chip for these measurements. Record maximum and minimum densities found in areas of uniform exposures. Compare with accepted standards for uniformity of development.

(3) Freedom from Physical Damage -- Use microscope to examine random processed chips for evidence of physical damage. Check for abrasions, scratches, image distortion, emulsion frilling, mottling, creases, drying marks, and foreign matter in the emulsion.

(4) Stretch and Shrinkage -- Determine if any significant amount of stretch or shrinkage of the emulsion occurred during processing. This can be accomplished by ~~xxxx~~ having a known measurement scale printed on the film chips. At least 25 chips from random process~~ing~~es should be evaluated for stretch or shrinkage.

(5) Compare resolution values, with a high power mocroscope, of processed chips against a known processor as above. Do not rely on the film manufacturer's resolution specs, as these specs, regarding resolution, tend to be conservative with respect to our interests in the limits of the resolution possible and not the average.

(6) Gamma -- Process several of the gray scale step wedges. Evaluate them by reading on a densitometer and plotting their corresponding characteristic H&D curves. Adjust developer concentration to produce an approximation of a controlled process that will yield an ideal density and gamma for film and chemical combination used, according to manufacturers specifications. As the control of gamma is a function of development, gamma can be altered by changing processing time, temperature or concentration. Assuming that an ideal concentration has already been established and will be maintained by proper replenishment, gamma can be controlled by temperature and speed. Prepare a family of characteristic curves (through the use of control strips) of speed and temperature relationships. These curves will become part of the processing specs for this processor.

(7) Archival Quality -- Determine the residual thiosulphate content of a sufficient ~~xxx~~ sampling of processed film to evaluate archival quality. Use the test procedure ASA PH 4.8, 1958.

E. Qulaity Control

(1) Chemical Analysis -- Chemical analysis should be performed daily during the test program. The developer should be analyzed for PH, hydroquinone, elon, and sulfite content. The fixer should be analyzed for PH, acid index, thiosulfate, and silver content. All data acquired from the analysis should be properly documented. The analysis will yield useful information in ~~xx~~ regard to accuracy of replenishment rates, general chemical oxidation rates and how individual film types affect chemical deterioration rates. Also, from these results, with proper replenishment, a life expectancy, should be determined for the processing solutions.

(2) Densitometric Standards -- When the process is assumed to be in reasonable control, several control strips (step wedges) (about 20) should be run. By reading, for example, the 11th, 15th, and 18th step, of the 21 step,

step wedge, of all the strips and averaging them respectively a preliminary processing standard can be set up. Three aim points are necessary for determining accurate control of the process. For a preliminary standard a density difference of ± .10-.15 can be used, from the average, for each of the three density aim points. More accurate aim points and exact maximum deviations from the aim points can only be established after ~~the~~ data has been collected from 100-200 control strips, processed at set intervals (Example 1 each hour). Then, by the following statistical formula an accurate densitometric control for this chip processor can be established.

$$\sigma = \sqrt{\frac{\sum x_1^2}{n} - \bar{x}^2}$$

σ - Standard Deviation

x_1 - Recorded Individual Value

$\bar{x}$ - Average Value

n - Number of Samples

The maximum deviation (Limits) can then be established by $L = \pm 3\sigma$

F. Maintenance -- Evaluate maintenance procedures as outlined in manual. Determine by testing where procedures are inadequate or adequate as described. Determine if gasket or seal materials will withstand the corrosion action of photographic chemicals with particular attention to the stop and/or fixing baths. During the test program continually inspect all parts of machine for evidence of corrosion due to chemicals.

G. Test Report -- Examine the records of the completed tests and evaluate the performance of the processor in each item tested as compared to existing standards of performance for similar work. Evaluate the overall performance of the processor taking into account the type of work to be performed, the expected operational environment, the qualifications of the operating personnel, the service and maintenance required, and the overall operating reliability.

Prepare and submit a written report summarizing the test method, describing the preparation of the test films, and reporting the evaluation of the results and the conclusions reached. Include the test records and representative samples of the processed material in the report. Make recommendations on any physical improvements, that can be incorporated into the chip processor, which would result in a higher quality product and in a product that would have greater repeatability.

[redacted] 25X1A

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